

Gravity Motor and Method

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to motors. Particularly the present invention relates to a motor that utilizes the force of gravity to impart rotational torque on a rotor.

2. Description of the Prior Art

Motors come in a variety of types. The function of any motor is to receive input energy and produce an output usually in the form of rotational torque through an output shaft. The shaft typically operates a load such as a generator to produce electricity, a pump to pump water, to turn a wheel, or to operate any other device requiring rotational torque.

A gravity motor is much like a wind machine, or a waterwheel, or a machine that operates by solar energy. All use natural, readily available energy sources. Generally, some means are provided for producing a weight imbalance either in or about the rotor to provide the rotary motion. Unlike wind or water or solar energy sources, gravity is a force with a constant value on earth. Harnessing this gravitational force as the input energy source for a motor would provide a motor that is not dependent on uncontrollable factors that determine the availability of the supply of the input source, which exists with wind, water or solar energy. Many

attempts have been made to design a motor that utilizes the force of gravity as the input energy source.

U.S. Patent No. 6,237,342 (2001, Hurford) discloses a gravity motor which is formed of at least one motor unit which has at least one motor member fixed to an output shaft. The output shaft is rotationally mounted on a housing. The housing includes a guide surface. The motor member is longitudinally movable relative to an output shaft. Each end of the motor member includes a weighted follower that is movable relative to a guide surface. The rotation of the motor unit caused one weighted follower to be moved toward the output shaft by the guide surface with the opposite weighted follower of the motor member being moved away from the output shaft. A problem with the Hurford device is the requirement to slide the entire follower shaft and the followers across the rotational axis of the motor, which increases resistance. Another problem is the multiplicity of parts involved.

U.S. Patent No. 4,121,420 (1978, Schur) discloses a gravity actuated thermal motor. The motor includes a rotor in the form of a ring-shaped annulus that is filled with water. A plurality of collapsible bellows is connected to and extends inwardly from the outer peripheral wall of the annulus into the water-filled chamber. In communication with each of the bellows and extending outwardly from the outer peripheral wall of the annulus is a plurality of refrigerant-containing tanks, one tank being in communication with the interior portion of one bellows. A source of heat in the form of a hot water trough is positioned at the lower portion of the rotor so as to be intercepted by the refrigerant containers upon rotation of the annulus. The vapor

produced by the volatile refrigerant expands the bellows and a locking device secures the bellows fully extended on the ascending side of the annulus. An automatic lock release is positioned near the top of the path of travel to release the bellows to enable it to contract during the time that the bellows at the bottom position is expanding. A disadvantage of the Schur device is that it requires water to act as the unbalanced weight, a refrigerant for expansion of the bellows, and hot water to cause the refrigerant to volatilize, not to mention the use of energy to heat the water. The Schur device also suffers from the use of a multiplicity of components, thus, increasing the possibility of mechanical failure.

U.S. Patent No. 4,311,918 (1982, Vaseen) discloses a wind-powered generator with gravity assisted mechanical advantage booster. It uses the mechanical advantage of a lever arm to multiply the energy of a moving or mobile weight from a propeller drive, which is wind powered. The unit consists of a counter balanced wheel on one side of a centerline shaft and a concentrated weight on the opposite side. Both are kept rigid by a connecting structure beam. The entire unit is made to revolve around the centerline shaft by moving a mobile weight around the wheel perimeter in concert with the unit's rotation. The major disadvantage of the Vaseen device is its reliance on wind energy to function.

U.S. Patent No. 5,221,868 (1993, Arman) discloses an electrically assisted gravity powered motor. The device has a plurality of hexagonal arms with two opposing shorter sides describing a circle as the arms are rotated by an interrupted axle running between the arms. There is sufficient room inside the hexagon for

weights on tracks between the two opposing sides to be moved by a fixed motor at one end of each track. The weight moves along the track through an axis in an unrestricted manner from one end to the other end and back while the arm is electrically rotated continuously in a 360° circle. The Arman device also suffers the disadvantage of requiring a second source of energy, electrical energy to drive the fixed motor at the end of each track.

U.S. Patent No. 3,735,839 (1973, Moisdon) discloses a gravity motor having a vacuum body that has a plurality of units. Each unit includes an unbalanced weight and mechanical gear box where either direction of rotation of a reversible shaft is used to tighten a mechanical spring coupled to the shaft of the motor for subsequent release to rotate the shaft as an output shaft. The disadvantage of the Moisdon device is the multiplicity of mechanical parts and the complexity of the device.

Each of the devices described above has disadvantages in one or more respects, which has hindered their widespread adoption and use.

Therefore, what is needed is a gravity motor that is simple, does not require the use of a second source of energy, and is easy to manufacture

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a gravity motor that does not require a second source of energy for the successful operation of the motor. It is another object of the present invention to provide a gravity motor that is simple to manufacture and assemble.

The present invention achieves these and other objectives by providing a gravity motor that has at least one hub mounted to a rotatable output shaft, a plurality of radial arms connected to the hub, a plurality of movable weights where each weight is slidably attached to one of the plurality of arms, a first guide surface positioned to guide the weights from the distal end of the radial arm to the proximal end of the radial arm near the hub, a second guide surface positioned to guide the weights from the proximal end near the hub to the distal end of the radial arm, and a support structure for supporting the rotatable output shaft and the first and second guide surfaces. The first and second guide surfaces are asymmetrical relative to the axis of rotation of the output shaft. Typically, the weights located at the distal end of the radial arm make initial contact with the first guide surface through each revolution of the radial arm when the gravitational potential energy of the weight is at approximately its lowest value through the rotation.

The present invention works in the following way. As a first movable weight comes into contact with the first guide surface, the first movable weight is moved along its radial arm to a position closer to the output shaft. This typically occurs when the radial arm has moved through a 90° rotational angle. While this is occurring, a second movable weight slidably connected to an opposite radial arm comes into contact with the second guide surface. The second movable weight is moved along its radial arm toward the distal end of the radial arm. The movable weight at the distal end of the radial arm is positioned at the end of the second guide surface so that the movable weight is subjected to the unrestricted, downward pull of

gravity. Since the second movable weight is located further from the output shaft than the movable weight that is being moved from the six o'clock position to the twelve o'clock position, there is a net downward rotational torque that causes the output shaft to rotate clockwise.

5 The present invention modifies energy from a natural source by using and including other physical aspects including momentum and centrifugal forces in conjunction with leverage, weight and cyclic shift to cause a continuous unsymmetrical rotary motion. The rotary motion acts upon a shaft to transfer energy for useful and beneficial purposes.

10 **BRIEF DESCRIPTION OF THE DRAWINGS**

FIGURE 1 is a perspective view of the present invention showing the drive unit, the movable weights, the first and second guide surfaces, and the rotatable shaft supported by shaft supports.

15 FIGURE 2 is a perspective view of the present invention shown in Fig. 1 with the front shaft support and the side walls removed for clarity.

FIGURE 3 is a front plan view of the present invention showing the rotor, the
20 movable weights and the guide surfaces.

FIGURE 4 is a perspective view of the hub of the rotor of the present invention.

FIGURE 5A is an expanded, perspective view of a movable weight of the present invention.

5 FIGURE 5B is a plan view of the major components of the movable weight.

FIGURE 6 is an isometric view of the present invention showing two drive units combined to form one gravity motor.

10 FIGURE 7 is a side view of the radial arms of the gravity motor shown in Fig. 6 showing their mirror-image assembly.

FIGURE 8 is a front plan view of the embodiment shown in Fig. 6.

15 FIGURE 9 is a front plan view of another embodiment of the present invention showing the gap between the guiding surfaces and the weights when magnets or magnetic material is used.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

20 The preferred embodiment(s) of the present invention are illustrated in Figs. 1-9. Referring to Fig. 1, gravity motor **10** includes a rotatable shaft **12** supported by a support structure **20**, and a drive unit **30** fixedly attached to shaft **12**, a first guide

surface **70** and a second guide surface **80**. Support structure **20** includes a first support wall **22**, a second support wall **24** and a bottom **26**. First and second guide surfaces **70** and **80** are secured to first support wall **22** with cam spacers **110**.

Support structure **20** also includes side walls **27** and **28**. Support walls **22** and **24**

typically have bearing assemblies (not shown) for supporting the rotatable shaft **12**.

It should be noted that drive unit **30** is rotatable clockwise, in this view, as noted by the direction of the arrow **2**. It should be understood that clockwise or counterclockwise rotation is relative to the point of view. Drive unit **30** would appear to rotate counterclockwise when viewed from support wall **24**.

Turning now to Fig. 2, first support wall **22** and side walls **27** and **28** are removed to provide an unobstructed view of drive unit **30** and the first and second guide surfaces **70** and **80**. Drive unit **30** includes a rotor **32** fixedly attached to shaft **12** and a plurality of movable weights **50**. Movable weights **50** have low friction between the weights **50** and the radial arms **38**. As shown in Fig. 3, rotor **32**

includes a hub **34** and a plurality of radial arms **38**. Each of the radial arms **38** is identical in length, width and shape. Radial arms **38** have elongated openings **39** along which weights **50** move from one end of the elongated opening **39** to the other end. First guide surface **70** is positioned to be contactable by each of the movable weights **50**. First guide surface **70** includes a concave surface **71** having a radius such that concave surface **71** causes each of the movable weights **50** to move in an unsymmetrical configuration, in turn, from the distal ends of radial arms **38** toward hub **34** as drive unit **30** rotates through about a ninety degree (90°) angle of rotation.

Second guide surface **80** is also positioned to be contactable by each of the movable weights **50**. Second guide surface **80** includes a convex surface **81** having a radius whereby the convex surface **81** causes each of the movable weights **50** to move, in turn, from near the hub **34** to the distal ends of radial arms **38** as drive unit **30** rotates
5 through about a one hundred ten degree (110°) angle of rotation.

Figure 4 shows an enlarged view of hub **34**. Hub **34** includes a central, through hole **35** for receiving shaft **12**, and a plurality of equally-spaced, radial recesses **36** for receiving the proximal ends of radial arms **38**. Although hub **34** has eight recesses for receiving eight radial arms, it should be understood that the
10 quantity of radial arms used on each hub is dependent upon the size of the weights used. The larger the weights the fewer number of radial arms that can be used due to the space required by the weights as they move from the distal ends of the radial arms **38** to the hub **34**. If larger weights are used, a second set of first and second guide surfaces **70** and **80** may be incorporated on the opposite sides of the radial
15 arms. Such an arrangement would cause a more even distribution of the force imposed on the weights by the guide surfaces. The force would be distributed onto a portion of the weight on each side of the radial arm in order to move the weights along the radial arms. This arrangement may enhance useful life of the weights, hub and radial arms. Radial arms **38** are secured to hub **34** using any fastening means
20 known to those skilled in the art. For example, radial arms **38** may be bolted in place, welded, etc. Hub **34** is fixed to shaft **12** preferably using a shaft key and a locking screw/bolt.

Turning now to Figure 5A, an example of a movable weight **50** is shown.

Movable weight **50** includes a radial arm guide **52**, a pair of bearing plates **54** and **54'**, a first race plate **58**, a second race plate **60**, and a pair of weights **64** and **64'**.

Second race plate **60** includes an undercut region **61** about its circumference for

5 receiving a needle roller shell bearing which rides against concave surface **71** and convex surface **81** as gravity motor **10** rotates.

As is more clearly shown in Fig. 5B, bearing plates **54** and **54'** include a pair of parallel slots **55** for ball bearings (not shown). Radial arm guide **52** has a width that is slightly narrow than the width of elongated openings **39** of radial arms **38**, and a thickness that is slightly larger than the thickness of radial arms **38**. The radial arm guide **52** bridges and connects, by way of bolts and/or machine screws, bearing plate **54**, race plate **60** and weight **64** on one side of radial arm **38** to bearing plate **54'**, race plate **58** and weight **64'** on the other side of radial arm **38** through the elongated opening **39**. Radial arm guide **52** is designed to permit the weights **50** to move between the distal and proximal ends of radial arms **38**. This is achieved by the use of ball bearings within slots **55** rolling between the surfaces adjacent the elongated openings **39** of the radial arms **38** and the surfaces of the first and second race plates **58** and **60**. Bearings are also used between radial arm guide **52** and the radial arm **38** to promote low friction as the weights **50** move back and forth along radial **38**. A variety of materials may be used to make the various components of the present invention. Examples of acceptable materials are steel, tungsten, aluminum, carbon fiber, and materials that exhibit similar strength and durability characteristics.

The components may be coated and/or heat-treated with other materials to enhance durability and low friction characteristics. It is noted that the weights may use other types of bearings and radial arms where the weights ride on the outside of the radial arms such that a central, elongated slot in the radial arm is not needed. In fact, it is the use of movable weights that are guided to move back and forth along a fixed radial arm as that radial arm rotates about an axis of rotation that is unique to the present invention.

With reference to Fig. 3, the operation of the gravity motor **10** of the present invention is as follows. An initial torque is applied to gravity motor **10** in the direction of arrow **2**, which starts drive unit **30** to rotate clockwise. When movable weights **50**, in turn, contact the portion of first guide surface **70** that is located at the six o'clock position, and as the drive unit **30** continues to rotate, the position and radius of concave surface **71** is such that weights **50** will be moved toward hub **34** until weights **50** are located, in turn, nearest hub **34**. While this is occurring, weights **50** that have completed their rotation of approximately 90° along concave surface **71** are now, in turn, positioned to contact a portion of second guide surface **80** that is located at the twelve o'clock position. The position of convex surface **81** is such that weights **50** will be moved away from hub **34** until weights **50** are located, in turn, at the distal ends of their respective radial arms **38**.

The result is the force of gravity, which is constant and in the direction of arrow **4**, exerts a clockwise torque on rotor **32**. Movable weights **50** are to be weighted to maximize this torque. Because movable weight **50a** is located further

from the hub **34** than movable weight **50e**, there is a net overall torque in the direction of arrow **2**. This overall torque produces the rotation of the shaft **12**. As long as this overall torque is greater than the losses that are inherently created in the operation of the gravity motor **10** of the present invention, then the drive unit **30** will
5 continue to rotate clockwise.

Referring to Figures 6, 7 and 8, there is shown another embodiment of the present invention. Within this embodiment, like numerals have been utilized relative to the first embodiment **10** of this invention to refer to like parts. However, instead of having a single drive unit **30**, there is also included a second drive unit **30'** located in
10 a mirror-image relationship, as shown in Fig. 7, connected to rotatable shaft **12**. Shaft **12** is mounted, as before, within the support structure **20**. Drive units **30** and **30'** are essentially identical and similar in construction. The position of each of the drive units **30** and **30'** could be such that the radial arms **38** and **38'** are in transverse alignment or in an offset alignment as shown in Fig 8. The offset alignment is
15 preferred for achieving a smooth running output torque within shaft **12**. It should be understood that any number of drive units **30** may be ganged together using appropriate supporting structures on a single shaft **12** to provide additional torque to the shaft **12**.

Low-friction coatings may also be used on the contacting surfaces of the
20 movable weights **50**, radial arms **38**, instead of bearings, and concave and convex surfaces **71** and **81**, respectively. Examples of low friction coatings are slippery plastic materials such as is commonly sold under the trademark "Teflon," or other

other plastic materials impregnated with oil for low friction characteristics. Magnets and magnetic material coatings may also be used. In this embodiment, the guiding surfaces **70** and **80** are made of a magnet, or other material coated with a magnetic coating, having a north pole and a south pole. The weights **50** are also magnets, or
5 other material coated with a magnetic coating, having a north pole and a south pole with their north pole positioned to interface with the north pole surface of the first guiding surface and their south pole positioned to interface with the south pole surface of the second guiding surface.

The movable weights **50** are connected to radial arms **38** in an equivalent
10 manner similar to the previously described ball-bearing based embodiment. The movable weights **50** become located directly adjacent the guide surfaces **70** and **80** but do not contact the surfaces. Because there are repelling poles between the movable weights **50** and the guide surfaces **70** and **80**, there will be an automatic repelling force created. As shown in Fig. 9, this repelling force will cause the weight
15 **50** to move away from guide surface **70** and be located a short gap **170** from concave surface **71**. Likewise, the repelling force will cause weight **50** to move away from guide surface **80** and be located a short gap **180** from convex surface **81**.

Although the preferred embodiments of the present invention have been described herein, the above description is merely illustrative. Further modification of
20 the invention herein disclosed will occur to those skilled in the respective arts and all such modifications are deemed to be within the scope of the invention as defined by the appended claims.